
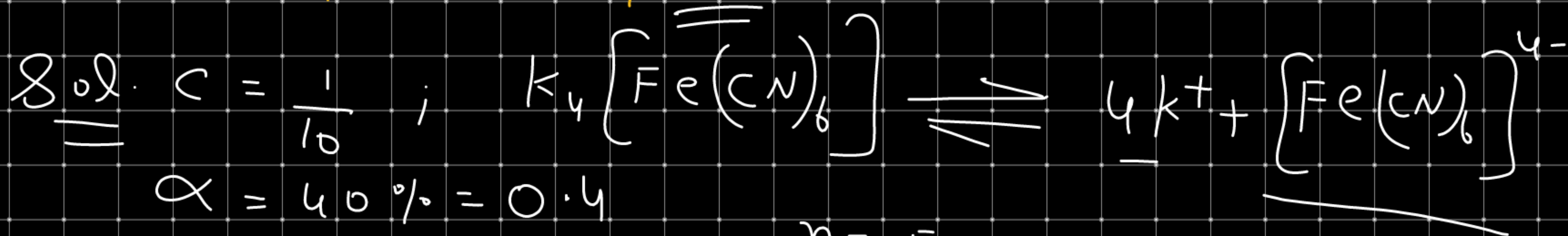


Q. 1 An aq. soln of decimolar potassium  ferrocyanide dissociates 40%. Cal.

π of soln at 27°C.



$$\bar{\pi} = i c R T$$

$$\alpha = \frac{i-1}{n-1} \Rightarrow 0.4 = \frac{i-1}{5-1}$$

$$\bar{\pi} = 2.6 \times \frac{1}{10} \times 0.0821 \times 300$$

$$i-1 = 1.6$$

$$\bar{\pi} = 2.6 \times \frac{1}{10} \times 24.6 \Rightarrow \boxed{\bar{\pi} = 6.4 \text{ atm}}$$

$$\boxed{i = 2.6}$$

→ 1.17 g. solute in 100 ml solⁿ.

Q.2. 1.17% aq. solⁿ of NaCl is isotonic with

7.2% aq. solⁿ of glucose. Cal vant Hoff factor
 of NaCl.

Sol.

$$\Delta_{\text{NaCl}} = \Delta_{\text{glucose}}$$

$$i_1 c_1 \cancel{RT} = i_2 c_2 \cancel{RT}$$

$$i_1 \times \frac{1.17}{58.5} \times \frac{1000}{100} = 1 \times \frac{7.2}{180} \times \frac{1000}{100} \Rightarrow \boxed{i_1 = 2}$$

Q.3. In an 0.2 m of aq. soln of monobasic weak acid (HX) have degree of dissociation is 0.3. Cal. freezing point of soln; $k_f = 1.86 \left(\frac{K - K_g}{\text{mol}} \right)$

Sol. $\Delta T_f = i k_f \cdot m$
 given :- $\alpha = 0.3$
 $m = 0.2$
 $k_f = 1.86$
 $\Delta T_f = 1.3 \times 1.86 \times 0.2$

$HX \rightleftharpoons H^+ + X^-$
 $n = 2$
 $\Rightarrow 0.3 = i - 1$
 $i = 1.3$
 $0.3 = \frac{i-1}{2-1}$
 $0.3 = \frac{i-1}{1}$

$$\Delta \bar{T}_f = 0.26 \times 1.86$$

$$\Delta \bar{T}_f = 0.48$$

$$\Delta \bar{T}_f = \bar{T}_f^{\circ} - \bar{T}_f$$

$$0.48 = 0 - \bar{T}_f$$

$$\bar{T}_f = -0.48^{\circ}\text{C}$$

Q.5 At 300 K the osmotic pressure of 0.1 M aq. soln of $MgCl_2$ is 4.92 atm.

Cal. degree of dissociation of $MgCl_2$.

Sol. given :-

$$T = 300 \text{ K}$$

$$C = 0.1 \text{ M}$$

$$\pi = 4.92 \text{ atm}$$

$$\alpha = ?$$



$$n = 3$$

$$\bar{\pi} = i C R T$$

$$4.92 = i \times 0.1 \times 24.6$$

$$2 \quad \cancel{4.92} = i \times \cancel{24.6}$$

$$i = 2$$

$$\alpha = \frac{i^{\circ}}{n} = \frac{1}{2}$$

$$\alpha = \frac{2}{4} = \frac{1}{2}$$

$$\Rightarrow \alpha = \frac{1}{2} = 0.5$$

$$\boxed{\alpha = 50\%}$$

V.V. imp.
Q. 6.

Which of the following aq. soln has least freezing point.

- (1) 1m Urea $i^{\circ} = 1$ (2) 1m K₂SO₄ $i^{\circ} = 3$ (3) 1m NaCl $i^{\circ} = 2$
 (4) 1m Al₂(SO₄)₃ $i^{\circ} = 5$

if $\alpha = 100\%$
 $\alpha = 1$
 then
 $i^{\circ} = n$

Ques. Following are equimolar aq. soln.

(a) 1m urea $i=1$ (b) 1m $MgCl_2$ $i=3$ (c) 1m CH_3COOH $2 < i > 1$ → weak acid.

(d) 1m Na_3PO_4 $i=4$ (e) 1m KCl $i=2$

arrange a, b, c, d, & e in increasing order of

(i) Boiling point

(ii) Freezing point

~~(iii) O.P.~~

(iv) V.P.

Sol.

$$(a) B.P.t. \propto \delta (c)$$

$$(a) < (c) < (e) < (b) < (d)$$

$$(b) \propto (d) \quad (d) < (b) < (e) < (c) < (a)$$

Azeotropic mixture

- # mixture of liquids which boils at constant temp., like a pure liquid is k/a azeotropic mixture.
- # Azeotropic mixture have same composition in liquid & vapour phase.

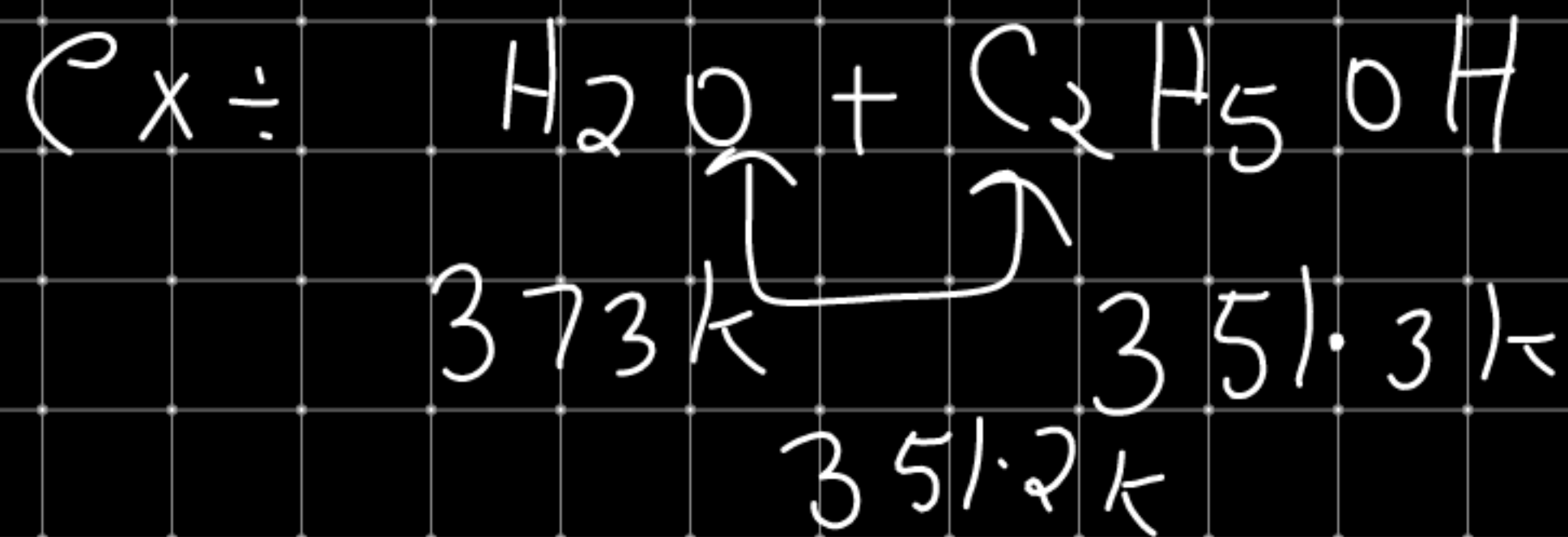
Components of azeotropic mixture

Cannot be separated by fractional distillation

There are two types of azeotropic mixture

(i) minimum boiling azeotropic mixture

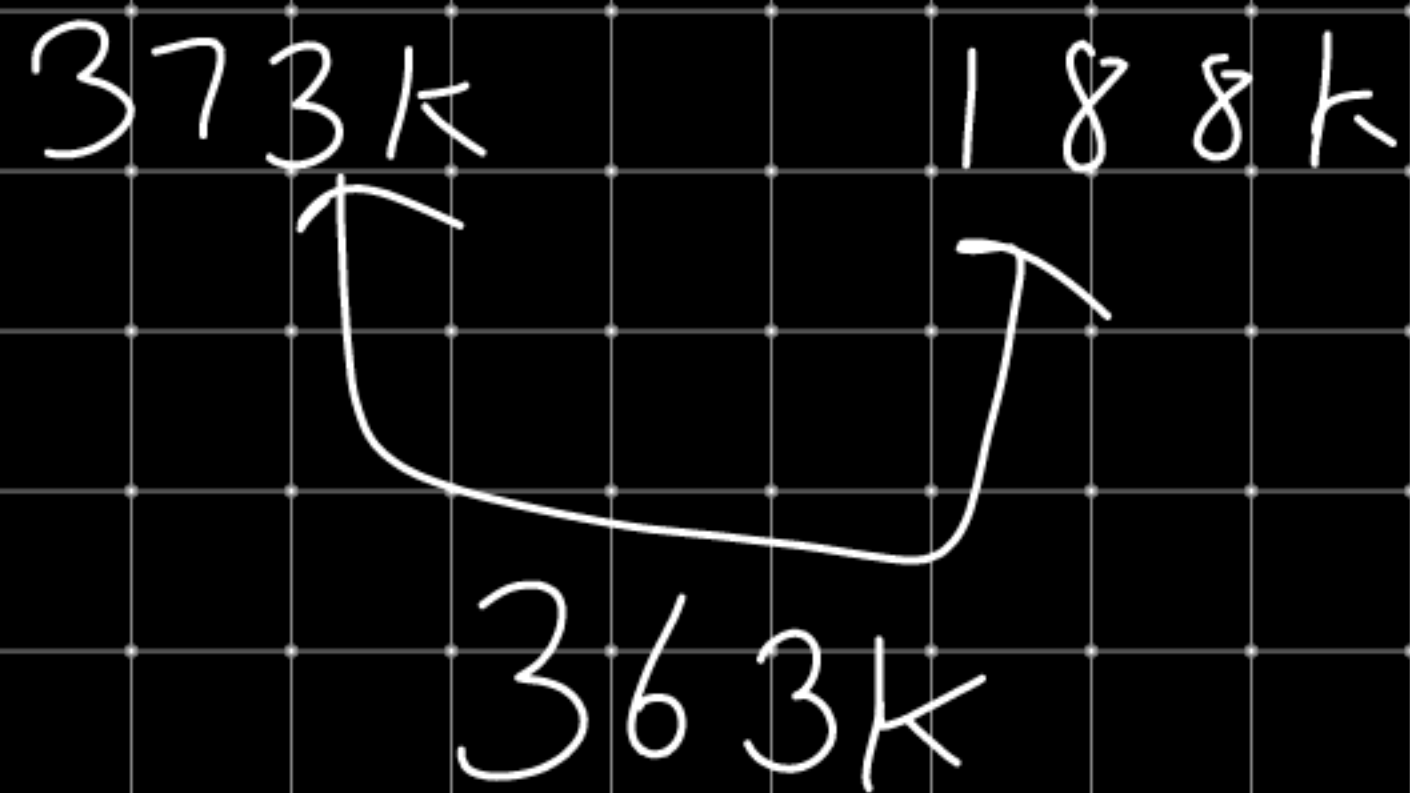
(+ve deviation)



(2) maximum boiling point azeotropic mixture

(-ve deviation)

$H_2O + HCl$



- #1 V.P. $\propto \frac{1}{C_i^0}$
- (2) R.L.V.P. $\propto C_i^0 \rightarrow (m)$
- (3) $\Delta T_b \left(\frac{P_A^0 - P_s}{P_A^0} \right) \propto i C \rightarrow (m)$
- (4) $T_b \propto i C$
- (5) $\Delta T_f \propto i C$
- (6) $T_f \propto \frac{1}{C}$

(7) $\Delta \propto i C$

For dilute solⁿ

$$m \approx M$$

OR

$$m \approx C$$